

RECOVERY PLAN

Mohr's Barbara's Buttons



U.S. Fish and Wildlife Service



RECOVERY PLAN

for

Mohr's Barbara's buttons
Marshallia mohrii Beadle & F.E. Boynton

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for

Southeast Region
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Approved:



Regional Director, U.S. Fish and Wildlife Service

Date:

November 26, 1991

Recovery plans delineate reasonable actions which are believed to be required to recover and/or protect the species. Plans are prepared by the U.S. Fish and Wildlife Service, sometimes with the assistance of recovery teams, contractors, State agencies, and others. Objectives will only be attained and funds expended contingent upon appropriations, priorities, and other budgetary constraints. Recovery plans do not necessarily represent the views nor the official positions or approvals of any individuals or agencies, other than the U.S. Fish and Wildlife Service, involved in the plan formulation. They represent the official position of the U.S. Fish and Wildlife Service only after they have been signed by the Regional Director or Director as approved. Approved recovery plans are subject to modification as dictated by new findings, changes in species status, and the completion of recovery tasks.

Literature citations should read as follows:

U.S. Fish and Wildlife Service. 1991. Recovery Plan for Mohr's Barbara's Buttons. U.S. Fish and Wildlife Service, Jackson, Mississippi. 15 pp.

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EXECUTIVE SUMMARY

Current Status: *Marshallia mohrii* is listed as a threatened species. It is currently known from 15 sites in Alabama (Bibb, Cherokee, and Etowah Counties) and 7 sites in Floyd County, Georgia. Historical records exist for Walker County, Georgia, and Walker and Cullman Counties, Alabama.

Habitat Requirements and Limiting Factors: This species typically occurs in moist prairie-like openings in woodlands and along shale-bedded streams. Populations extending onto rights-of-way (ROWs) are threatened by routine application of herbicides, future road expansion, and the potential use of these ROWs for installation of utility lines (water and sewer lines). Suitable habitat continues to be converted for agricultural or silvicultural use.

Recovery Objective: Delisting.

Recovery Criteria: This species will be considered for delisting when there are 15 viable populations and all are protected from present and foreseeable human-related and natural threats. At least three populations each should be located within the two physiographic regions represented by its historic range (Cumberland Plateau, Ridge and Valley). In addition, at least three of the 15 populations should be located within Alabama and three in Georgia. Viability of populations will be assessed through monitoring for a period not less than 15 years.

Actions Needed:

- (1) Protect and monitor populations.
- (2) Search for additional populations.
- (3) Conduct demographic studies and gather life history information.
- (4) Characterize habitat.
- (5) Determine and implement appropriate management.
- (6) Preserve genetic material.

Total Estimated Cost of Recovery: It is not possible to determine costs beyond the first few years. Implementation of tasks over the next 3 years, for which cost estimates have been made total \$99,000.

Date of Recovery: Impossible to determine at this time, pending further studies of the species' requirements and results of surveys for new populations.

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I. INTRODUCTION

Marshallia mohrii is only known from 15 locations in Alabama. There are seven known locations in Georgia, all discovered in 1991 by James R. Allison. One of these apparently extends slightly into Alabama. On September 7, 1988, the U.S. Fish and Wildlife Service (1988) officially listed Mohr's Barbara's buttons (Marshallia mohrii Beadle & Boynton) as a threatened species under the Endangered Species Act of 1973, as amended.

Description and Taxonomy

Marshallia mohrii, a member of the sunflower family (Asteraceae), was described in 1901 by Beadle and Boynton. This species is an erect perennial herb, 3 to 7 decimeters (1 to 2.3 feet) tall. The leaves are alternate, 8 to 20 centimeters (cm) (3.2 to 7.8 inches) long, firm-textured, three-nerved, and lanceolate-ovate in shape. Leaves are often clustered near the base and gradually reduce in size upwards. The flowers are typically produced in several heads in a branched arrangement. The heads are approximately 2.5 cm (1 inch) broad and consist of disk flowers (tubular in shape) which are pale pink or white in color. The fruit is an achene (Kral 1983, McDaniel 1981).

Marshallia mohrii, a tetraploid, is in the Grandiflora complex along with two diploid species, M. grandiflora and M. trinervia (Watson *et al.* 1991). Watson *et al.* (1991) suggest an allotetraploid origin for M. mohrii, possibly involving these two species or one of them and a more distantly related diploid species. Morphologically, Marshallia is a close-knit genus and few species exhibit distinct morphological boundaries (Watson and Estes 1990). Marshallia mohrii most closely resembles M. grandiflora (Channell 1957, Watson and Estes 1990, Watson *et al.* 1991). Marshallia grandiflora typically produces a single flowering head and M. mohrii typically produces a multi-headed inflorescence (M. grandiflora) occasionally produced multiple heads in greenhouse conditions (1990) and Allison (1991) observed solitary heads in some depauperate plants of M. mohrii. Channell (1955, 1957) considered head/floret size and degree of dilation of corolla tubes to be additional distinguishing characteristics between these two species. Watson and Estes (1990) noted overlap in these characters, however, they consider the two to be distinct entities due to their habitat specificity and differences in chromosomal configurations and ploidy levels. The thin-textured, ovate-shaped leaves, and slender rhizomes of M. trinervia serve to distinguish this species from M. mohrii. Marshallia obovata occurs near M. mohrii at several sites but is readily distinguishable by its nearly scapose habit, single flowering head which is always white, and by its blooming and fruiting several weeks earlier.

Reproductive Biology and Genetic Diversity

Marshallia mohrii is protandrous (anthers release pollen before pistil of that flower is receptive) and appears to be an obligate outcrosser (Watson and Estes 1990). Marshallia appear not to have established significant genetic barriers to crossing, as the majority of the species are cross-fertile (Watson and Estes 1990).

Marshallia in the Grandiflora complex were shown to have reduced genetic variation, as compared to other outcrossing species, by Watson et al. (1991). This reduction may be a function of the small populations sizes (and inevitable inbreeding) typical of the three species in this complex. Marshallia mohrii was shown to have the greatest total variation of the three species within this complex, with greater within population diversity than among population diversity (Watson et al. 1991).

Distribution and Population Size

Populations of Marshallia mohrii are historically known from two different physiographic regions (Cumberland Plateau and Ridge and Valley). This species was first collected in 1893 by Mohr in Cullman County, Alabama. Several collections of this species were made near Cullman around the turn of the century and one record during this time exists for Walker County, Alabama, and Lookout Mountain, in Walker County, Georgia (Channell 1955, 1957, McDaniel 1981). Only vague locality information exists with these specimens and with the exception of Walker County, Alabama (Whetstone 1979, Kral pers. comm.), this species has not been collected in these areas in recent times.

Kral's (1973) discovery of this species in Cherokee County, Alabama, in 1969, marked the first time this species had been observed since 1941. Marshallia mohrii is currently known to exist at 15 sites in Alabama, including one population in Bibb County, four populations in Etowah County, and ten in Cherokee County. Five, relatively recently reported Alabama populations (post 1974), have not been relocated, including two each in Cherokee and Walker Counties and one in Bibb County (Figure 1).

In Alabama, populations appear to be concentrated primarily in two areas, eastern Etowah County and central Cherokee County, Alabama. Within each of these Counties, most populations are within 0.8 to 3 kilometers (0.5 to 2 miles) of one another. The largest populations occur in Cherokee County, with an estimated 1,000 plants at two sites. Seven sites support limited populations (12-50 individuals) and six support moderate-sized populations (100-200 individuals).

Of the seven known locations in Floyd County, Georgia, two locations are found north of the Coosa River and five to the south of it, with a maximum distance between sites of about 7.5 miles. Three sites support limited populations (17-50 individuals) and four support moderate-sized populations (100-300) (Allison 1991).

Habitat and Ecology

Marshallia mohrii typically occurs in moist, prairie-like openings in woodlands and along shale-bedded streams. Several populations are located in swales extending onto rights-of-way (ROWS). The soils are sandy clays, which are alkaline, high in organic matter, and seasonally wet. Most currently known populations occur on soils of the Conasauga-Firestone

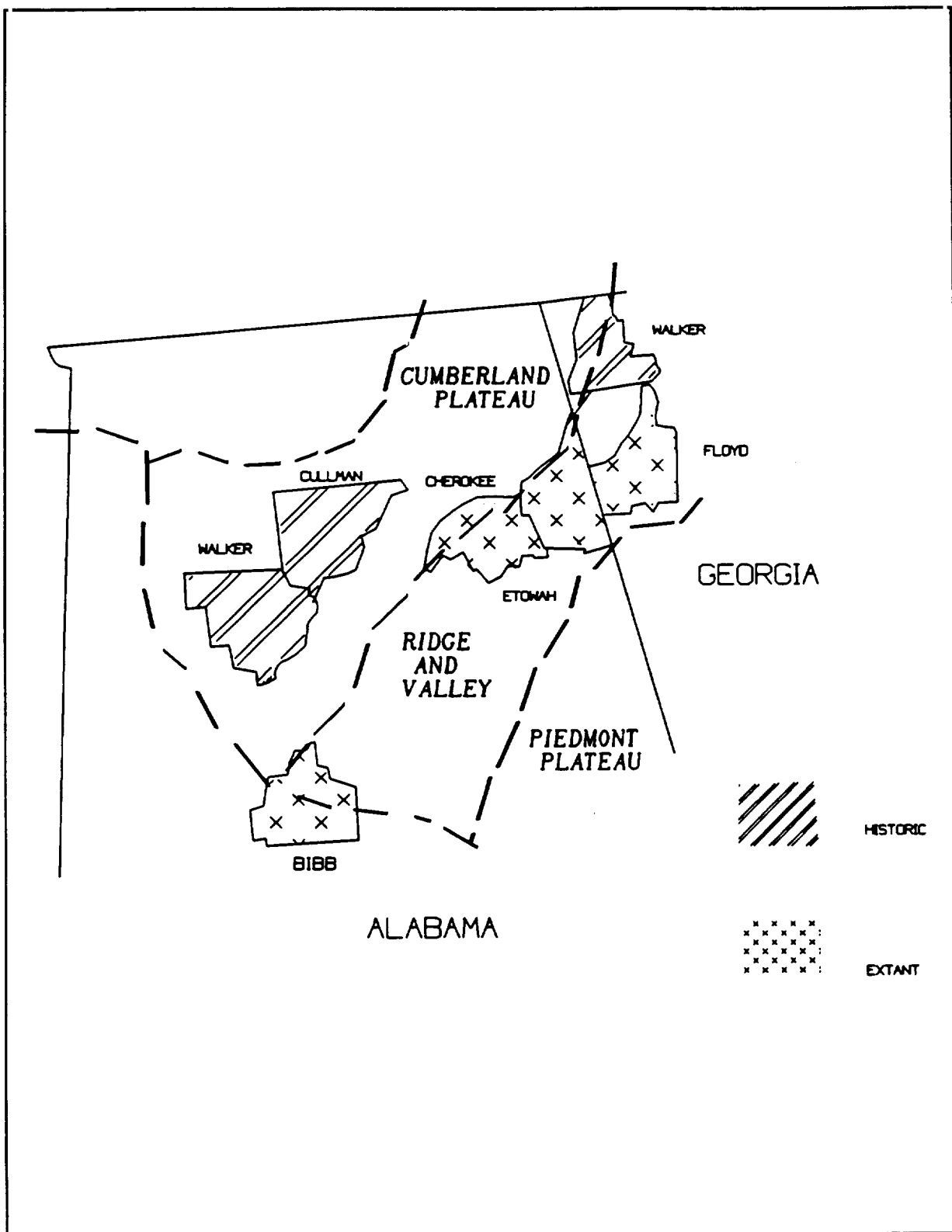


Figure 1. Known Range of Marshallia mohrii

Association. Plants occur in full sun or partial shade in a grass-sedge community. Common associates include Helenium autumnale, Helianthus angustifolius, Lythrum alatum, Ruellia caroliniensis, and prairie elements such as Asclepias viridis, A. hirtella, Helianthus mollis, and Silphium terebinthinaceum, one of the best indicators of suitable soils for Marshallia mohrii (Allison 1991). Allison (1991) notes that the potential to find Marshallia mohrii increases when Lythrum alatum is found with Silphium terebinthinaceum, indicating that the soils are at a "moister" zone of tolerance range for this Silphium. The endangered Clematis socialis (Alabama leather flower) and Sarracenia oreophila (green pitcher plant) occur with M. mohrii at two separate sites. The surrounding forest type is mixed hardwoods with various species of oak and pine (Kral 1983, McDaniel 1981).

This species appears to maintain itself only in areas which are naturally or artificially cleared and was probably maintained naturally through occasional fire or local soil conditions that promoted a grass-sedge community (Kral 1983).

Threats

Marshallia mohrii is threatened by the potential destruction or adverse modification of its habitat. Ten populations are confined to roadside ROWs and at several other sites plants extend onto ROW swales. These plants are vulnerable to accidental disturbances. Any future road improvements (expansion) or roadside maintenance activities (i.e., herbicide treatment, bulldozing, planting of non-native competitive grasses, mowing during flowering) at these sites, could adversely impact or destroy populations if proper planning does not occur. Furthermore, these ROWs often serve as sites for installing utility lines (particularly water/sewer lines) and such poses an additional threat to this species.

Plants on privately-owned sites are potentially threatened by the conversion of their habitat to improved pastureland through drainage, seeding with forage grasses or plowing and disking (Kral 1983, McDaniel 1981). Much of the species' suitable habitat has been converted to pastureland, cropland, or pulpwood plantation.

This species has a limited distribution and a small number of individuals at many of the sites and is therefore vulnerable to future declines. This species' survival is dependent upon the maintenance of prairie-like openings (McDaniel 1981); therefore, woody succession poses an insidious threat to this species and its habitat.

Conservation Measures

Personnel of the Alabama Highway Department (Department) are aware of the plants on or near the ROWs they maintain and of the importance of protecting them. An informal agreement exists between the U.S. Fish and Wildlife Service (Service) and the Department for protection of the plants on their ROWs. This involves the abolishment of herbicides near these sites and a

special mowing schedule to allow the species ample time to flower and set seed. Mowing, at appropriate times, may actually enhance populations by reducing competition and spreading seeds.

One population on private land in Cherokee County is protected through a long-term Cooperative Agreement. This Agreement was originally set up to protect the endangered green pitcher plant which also occurs at this site.

Surveys are ongoing in Georgia which may result in additional "new" populations in that State.

II. RECOVERY

A. Objective

Marshallia mohrii will be considered for delisting when there are at least 15 viable populations of this species and all are protected from any foreseeable human-related or natural threat. At least three populations should be located within the two physiographic regions represented by its historic range (Cumberland Plateau, Ridge and Valley). At least three populations should be located within Alabama and three in Georgia. Viability of populations will be assessed through periodic monitoring for at least a 15-year period. The number of individuals necessary and the quantity and quality of habitat needed to meet these criteria will be determined as one of the recovery tasks.

A viable population is a reproducing population that is of sufficient size and genetic variability to enable it to survive and respond to natural habitat changes (stable or increasing).

These recovery criteria are preliminary and may be revised on the basis of new information.

B. Narrative Outline

1. Protect populations and habitat. The first step in the recovery process is to protect existing populations from any present or foreseeable threats. Only 22 populations of this species are known and protection should be initiated for all. The long-term protection of 15 populations is considered to be essential to the recovery of this species, at this time.
 - 1.1 Contact landowners and negotiate protection. Landowners of all sites should be contacted and encouraged to protect populations on properties they own or manage. Populations are located on private lands and County or State-maintained rights-of-way (ROWs). Some level of protection should be initiated for all sites; however, first priority should be given to those sites supporting the largest and most vigorous populations on relatively unaltered habitat. Landowner contacts can be initiated with the assistance of the state Heritage Programs and The Nature Conservancy field offices. Protection efforts, exclusive of Section 7, may include land donations, fee acquisitions, conservation easements, short-term leases (conservation agreements), or other methods. Short-term protection methods should be viewed as an interim step towards more permanent protection methods; however, short-term strategies may be the only alternative if private landowners are not agreeable to, or monies are not available for, more permanent protection measures.

Populations which extend onto roadside ROWs will only be protected with the assistance and cooperation of State or County transportation departments. An informal protection agreement currently exists between the Service and the Alabama Highway Department for those plants on their ROWs. A management plan, outlining appropriate protective measures, should be formalized with the public agencies with responsibility for these ROWs.

- 1.2 Search for additional populations. Surveys have been conducted for this species in the past with limited success. However, a thorough systematic search for new populations is needed, particularly in the Cumberland Plateau where no extant sites are known.

Potential habitat should be identified by an investigation of the habitat of known populations for common ecological characteristics and indicator species. A thorough examination of soil, topographic or other maps should follow. Extant populations occur on soils of the Conasauga-Firestone Association. Searches should be carried out when the species is in flower and for a minimum of two field seasons. Surveys are ongoing in Georgia and will continue into 1991. Protection for new populations should be pursued as outlined under Task 1.1.

2. Determine population size. Each population should be visited and their boundaries determined and permanently marked. Each occurrence should be plotted on large-scale maps with appropriate topographic and cultural features (roads, telephone poles, etc.) indicated as reference points. Additional information to gather should include the amount of area occupied by the population (approximate hectares or meters) and/or the number of plants.
3. Conduct demographic studies and obtain life history information. Such information is essential to understanding the dynamics of the population and critical to determining appropriate management.
 - 3.1 Initiate demographic studies. Intensive demographic studies should be conducted for selected populations. Populations selected should encompass the range of habitat types, including those in altered and relatively undisturbed conditions. Studies should obtain information on all aspects of this species' life cycle. These studies will aid in identifying those stages most important to population growth and will be essential to predicting future population trends.
 - 3.2 Determine life history characteristics. Determine additional life history parameters to be investigated through an analysis of available literature and information gathered from the demographic studies. Additional information may be needed on

breeding systems, pollination biology, seed dormancy, germination requirements and others. This task may require laboratory analysis in addition to field studies.

4. Determine parameters of a viable population. The long-term survival of the species will be ensured only if a sufficient number of viable populations are protected. This task is essential to defining recovery criteria. The components of a viable population which need to be determined include minimum number of individuals and the size and quality of habitat, in addition to the number of populations and their geographical spacing. Information gained from the demographic studies will be essential to completing this task. The amount of genetic variability within and among populations, may be important in assessing minimum viable population parameters for this species. Analysis of a limited number of populations of M. mohrii showed that diversity was greater within populations than among populations. However, the total amount of genetic variation was low as compared to other outcrossing species (Watson et al. 1991). Additional analysis of genetic variability for populations will be determined through isozyme analysis, if deemed necessary.
5. Determine habitat characteristics. An understanding of this species' ecology is an important component to determining what factors limit its distribution. Information gained will aid in surveys for additional populations, provide information on what factors maintain habitat naturally, and insure that populations are appropriately managed and protected.
 - 5.1 Characterize general habitat. All populations should be visited in order to develop a habitat profile. A complete list of associated species should be compiled for the sites by visiting each one several times during the growing season. Soil analysis should be conducted at all sites including mineral composition, soil texture, pH, organic content, soil moisture plus any other parameters considered to be appropriate. Other factors to study include topographic relations, elevation, watershed, and moisture and light relations. Light measurements and overstory coverage can be estimated at selected sites within populations.
 - 5.2 Analyze microhabitat. Separate plots may be established to intensively study microsite features (i.e., moisture, light intensity, competition) and the condition of individual plants. This analysis may be done in conjunction with Task 3.1.
6. Determine and implement appropriate management. Management of habitat, as well as protection, appears to be essential for ensuring that vigorous populations are maintained. Management needs of this species are largely unknown; however, the populations which appear most vigorous are located in prairie-like openings with little woody competition. Kral (1983) speculates that populations were

maintained by occasional fire or local soil conditions that promoted a grass-sedge community. Management will focus on removing competing vegetation and should strive to mimic natural factors which maintained habitat historically.

- 6.1 Conduct management technique experiments. Experiments should be designed to evaluate the cost and effectiveness of different management techniques. Long-term effects should be determined through observations of permanent study plots over many years (see Task 7). Changes in associated vegetation should be noted in addition to the response of the target species. Management techniques to experiment with include controlled burns (various intervals and seasons) and removal of overstory and competing vegetation by manual (hand-clearing) or mechanical means (mowing, selective timber cutting).
 - 6.2 Prepare individual site management plans. Make use of findings from the above research (Task 4.1) to determine the best way to maintain each individual population. Prepare management plans for each site.
 - 6.3 Implement management plans. Implement management outlined in individual site plans.
7. Conduct monitoring studies. A general monitoring program should be devised and implemented on sites in order to track population trends and evaluate the effectiveness of recovery efforts. Plots and/or transects may be used to measure parameters deemed appropriate through demographic studies and may include frequency, percent cover, numbers of individual plants, and flowering and fruiting. General observations and simple counts may suffice for the smaller populations. Populations should be periodically monitored for at least a 15-year period. In addition to the measurement of selected parameters, general weather conditions and any disturbances should be noted.
 8. Preserve genetic stock. Protection of the gene pool should be accomplished through seed bank storage and by maintaining material in cultivation. These activities will also provide material for research and horticultural interests.
 - 8.1 Establish seedbank. Seed should be collected from all natural populations at the appropriate time (as determined through Task 3). Some seed should be stored in a long-term storage facility and tested for viability every few years. These activities should be conducted under the guidance of the Center for Plant Conservation.
 - 8.2 Maintain material in cultivation. Populations should be maintained in cultivation to provide material for research and education. This species is currently maintained at

Woodlanders, a conservation-minded nursery which specializes in native plants.

C. Literature Cited

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III. IMPLEMENTATION SCHEDULE

Priorities in column one of the following implementation schedule are assigned as follow:

1. Priority 1 - An action that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.
2. Priority 2 - An action that must be taken to prevent a significant decline in species population/habitat quality or some other significant negative impact short of extinction.
3. Priority 3 - All other actions necessary to meet the recovery objective.

Key to Acronyms Used in Implementation Schedule

FWS - U.S. Fish and Wildlife Service
FWE - Fish and Wildlife Enhancement
TNC - The Nature Conservancy
ALNHP - Alabama Natural Heritage Program
GADNR - Georgia Department of Natural Resources
ALHD - Alabama Highway Department
CPC - Center for Plant Conservation
Pvt - Private individuals, universities or research organizations with botanical expertise

IMPLEMENTATION SCHEDULE

PRIOR- ITY #	TASK #	TASK DESCRIPTION	TASK DURATION	RESPONSIBLE PARTY			COST ESTIMATES (\$K)			COMMENTS/NOTES
				USFWS		Other	FY 1	FY 2	FY 3	
				Region	Division					
1	1.1	Protect populations	Ongoing	4	FWE	ALNHP TNC ALND GADNR				Costs undetermined
2	1.2	Survey for new sites	2 years	4	FWE	ALNHP GADNR	5.0	5.0		
2	2	Determine size of population	1 year	4	FWE	ALNHP GADNR		3.0		
2	3.1	Demographic studies	3 years	4	FWE	ALNHP Pvt GADNR	5.0	5.0	5.0	
2	3.2	Life history characteristics	3 years	4	FWE	CPC Pvt	5.0	3.0	3.0	
2	4	Viable population parameters	3 years	4	FWE	Pvt	4.0	4.0	4.0	
2	5	Habitat analysis	2 years	4	FWE	ALNHP Pvt GADNR	5.0	5.0		
2	6.1	Management experiments	3-5 years	4	FWE	ALNHP Pvt GADNR	10.0	5.0	5.0	
2	6.2	Prepare site plans	1 year	4	FWE	ALNHP Pvt GADNR			2.0	Combine with Task 6.1
2	6.3	Implement management	Ongoing	4	FWE	ALNHP Pvt GADNR				Costs undetermined
3	7	Monitor populations	Ongoing	4	FWE	ALNHP Pvt GADNR	5.0	3.0	3.0	
3	8	Preserve genetic stock	Ongoing	4	FWE	CPC			5.0	

IV. APPENDIX

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